

# ***Water Purification Training***



3D Marines

# **Water Purification**

## **Terminal Learning Objectives**

**Given a combat environment (day and night), individual combat equipment and required water purification materials, perform water purification**



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# Enabling Learning Objectives

- Without the aid of reference materials and given a list, select the four general sources of water used in the field, in order of preference
- Without the aid of reference materials and given a list, select the characteristics of the four water sources
- Without the aid of reference materials and given a list of types of water containers and a list of quantities, correctly put them in proper sequence
- Without the aid of reference materials and given a list of compounds, select the primary type of disinfectant used in the field for sanitizing large quantities of water
- Given a quantity of water, a canteen and cup, and iodine tablets, sanitize a canteen of water for consumption



# Factors Affecting Sources of Water

## 1. Water Quantity

- a. Provides adequate quantity for all hands
- b. Provide adequate quantity for duration of exercise/operation

## 2. Water Quality

- a. Free of contamination such as runoff from sewage or toxic chemicals from industrial plants
- b. Appearance of water is not excessively turbid and smell is acceptable
- c. The water must be able to be treated with available resources like Reverse Osmosis Purification Unit (ROWPU)



# Water Sources and Characteristics (IN ORDER OF PREFERENCE)

## 1. Salt Water

A. Sources – Ocean

B. Characteristics:

- 1) Plentiful, generally less contaminated
- 2) Unlimited Supply
- 3) Best source of water, if near the sea or ocean and if a ROWPU is available

## 2. Ground Water

A. Sources

- 1) Wells
- 2) Springs



# Water Sources and Characteristics (IN ORDER OF PREFERENCE)(cont.)

## B. Characteristics

- 1) Plentiful, generally less contaminated
- 2) Unlimited Supply
- 3) Calcium Hypochloride (HTH) used to keep the Free Available Chlorine(FAC) level to 2.0 parts per million (PPM)
- 4) Quantity hard to determine

## 3. Surface Water

A. Sources: Rivers, Lakes, Ponds, Streams



# Water Sources and Characteristics (IN ORDER OF PREFERENCE)(cont.)

## B. Characteristics

- 1) Larger sources generally less contaminated than small sources
- 2) Capable of supplying adequate quantities
- 3) Readily accessible quantities
- 4) Moving water generally better than still because aeration severely retards growth of bacteria, algae, or fungus



# Water Sources and Characteristics (IN ORDER OF PREFERENCE)(cont.)

## 4. Rain Water

- A. Not a reliable source due to fluctuation in annual rainfall levels
- B. May not provide adequate quantities





# Quality of Water

## 1. Color

- A. Causes of Discoloration: Vegetable matter, Mineral matter, Industry waste, Turbidity
- B. May be harmful or harmless depending on the cause
- C. Use clearest/colorless water available

## 2. Taste/Odor

- A. Causes: Algae, Organic matter, dissolved gases, Industrial Wastes



# Quality of Water (cont.)

Palatability is easily affected, which in turn, affects the amount of water the troops consume. Use of filters and correct levels of chlorination can improve palatability; too much chlorine makes most taste and odor problems worse



# Turbidity

Turbidity is defined as, “Causes which may result in a muddy or unclear condition.”

Reasons for turbidity:

- Suspended particles of sand
- Clay
- Organic matter



# Turbidity (cont.)

Removal of turbidity is essential in reducing contamination. Suspended particles often contain organisms that cause disease such as Hepatitis, Cholera, and Dysentery.

Turbidity also decreases the effectiveness of chlorine



# Temperature

Warm water tastes flat and more chlorine must be used. Cool water retains chlorine residual longer. Water consumption by the troops will decrease as the water temperature increases.



# Surrounding Vegetation

Make sure to observe the surrounding vegetation around the water source. Dead or decaying vegetation may indicate water contamination.



# Potable Water

Water that is free from disease producing organisms (hepatitis A, Typhoid, ect.), NBC Agents, organic and inorganic poisonous substances.



# Procedures for Water Disinfection

## 1. Use iodine tablets

- Remove the cap from the canteen and fill the canteen with the cleanest water available
- Put one tablet in clean water
- Put two tablets in cloudy water
- Replace the cap and wait 5 minutes
- Shake the canteen
- Loosen the cap and tip the canteen over to allow leakage around the canteen threads
- Tighten the cap and wait another 25 minutes before drinking (total of 30 minutes)



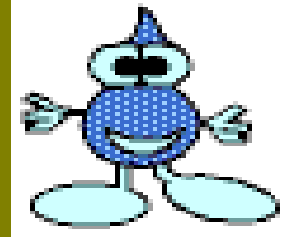


# Procedures for Water Disinfection (cont.)

## 2. Use calcium hypochlorite

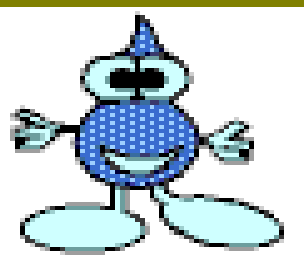
- Fill a canteen cup half full of water and add calcium hypochlorite from one ampule. Stir with clean stick until powder is dissolved
- Fill cap of plastic canteen half full of the solution in cup
- Add it to water in the canteen
- Place cap on the canteen
- Shake it thoroughly
- Loosen cap slightly and invert canteen
- Let treated water leak onto threads around neck of canteen
- Tighten cap on canteen and wait at least 30 minutes before using water for drinking or cooking





# Fluid Goals

**Prevent Dehydration**  
***Drink Before You're Thirsty***



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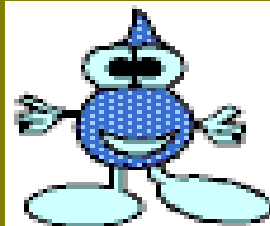
# Symptoms of Dehydration

- Dark Urine
- Small Volume of Urine
- Elevated Heart Rate
- Headache

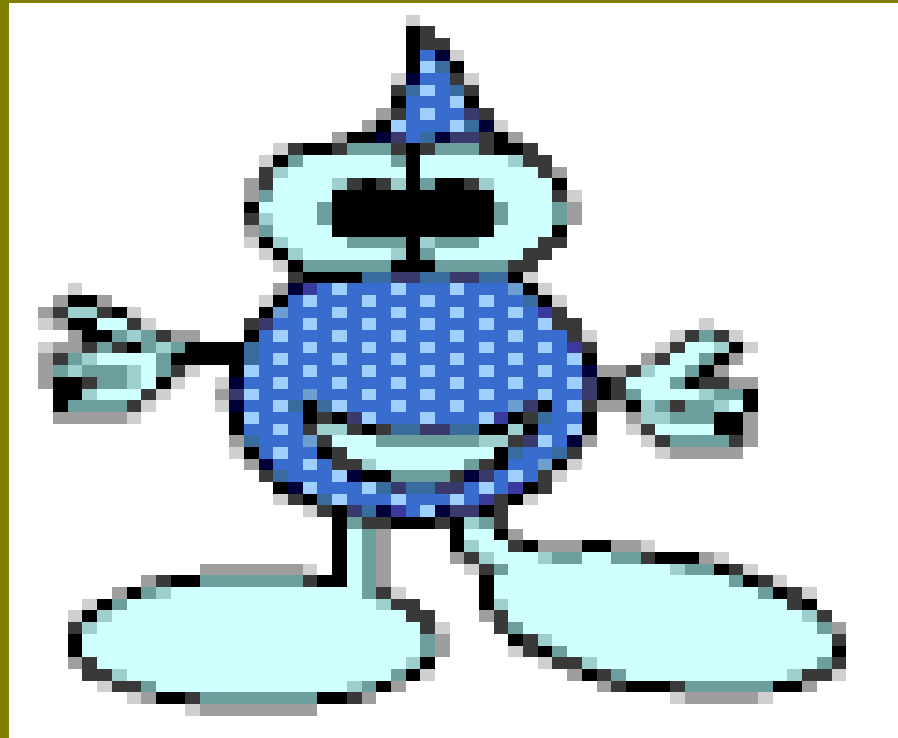


# Dehydration hurts performance

<b>Percent</b>	<b>Pounds lost (for 150 pound person)</b>	<b>Effects</b>
1%	1.5	Increased body temperature
3%	4.5	Impaired performance
5%	7.5	G.I. Problems, heat exhaustion
7%	10.5	Hallucinations
10%	15	Circulatory collapse



# What's best for fluids?

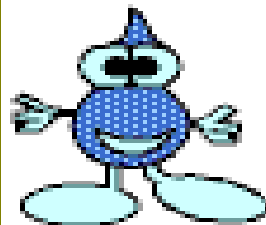


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# Fluid Choices

- Exercise < 90 minutes: WATER
- Exercise > 90 minutes: WATER + 6-8% CHO

	<b>% CHO</b>	<b>cals/8 oz.</b>
Gatorade	6	50
Exceed	7	70
Cola	11	100
Apple juice	12.5	120

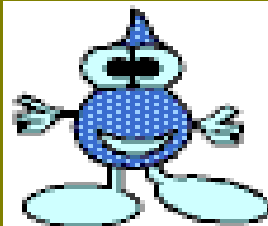


# Fluid Guidelines

Event	Cups (8oz.)
2 hours before	2-3 +
15 min. before	1-2
Every 15-20 min. during	1+
Afterwards	Until urine is pale



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# Do I need sports drinks to replace electrolytes?

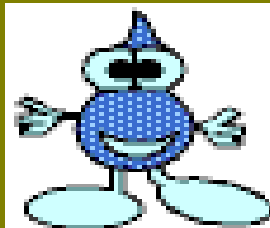


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# Sodium and Potassium

- Typical diet provides enough
- Electrolyte intake during exercise
  - Moderate exercise: not necessary
  - Ultra-endurance events: wise choice



# Sodium losses

One pound sweat lost: 450-700 mg.

Losses in one hour hard exercise in heat: 900-2,800 mg.

Body contains: 97,000mg.(42 tsp.. Salt)

<b>Replacements</b>	<b>mg.</b>
Coke	1
Orange juice, 8 oz.	3
Beer, 8 oz.	10
Exceed, 8 oz.	50
Gatorade, 8 oz.	110
Pizza, 1 slice	500
Salt, 1/4 tsp.	500
Pretzels, 1 oz.	500



# Potassium losses

One pound sweat loss: 80-100 mg. Potassium

Losses in one hour hard exercise in heat: 160-400 mg.

Body contains: 170,000 mg. Potassium

Replacements	mg
Coke, 8 oz.	5
Gatorade, 8 oz.	25
Exceed, 8 oz.	45
Beer, 8 oz.	100
Yogurt, 8 oz.	350
Orange juice, 8 oz.	500
Banana, medium	550
Potatoe, medium	750



# Prevention

- Adhere to work / rest cycles according to heat index
- Drink diluted mineral replacement (sports drink) drink throughout activity
- Avoid overexertion for extended length of time and po  
take turns as a safety man for a crew (depending on a
- Be prepared with the proper equipment in case there
- Know the number to EMS and the closest medical fac



***Are there any  
questions?***



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